

REMARKS

The Office Action dated September 22, 2009 has been received and carefully noted. The above amendments and the following remarks are being submitted as a full and complete response thereto.

Claims 2-5 and 7-11 have been rejected. Claims 2 and 7 have been amended and claims 1 and 6 have been cancelled. Support for the amendments can be found in the specification as originally filed, including at least in paragraph [0043]. Applicants respectfully request reconsideration and withdrawal of all rejections.

Rejection Under 35 U.S.C. §102

Claims 2-5 and 7-11 are rejected under 35 U.S.C. §102(b) as being anticipated by Okuda et al. (U.S. Patent No. 5,635,455, hereinafter "Okuda"). The Applicant respectfully traverses these rejections, because Okuda fails to disclose each and every feature of independent claims 2 and 7.

Independent claim 2 discloses, amongst other features, an electron spectroscopy analysis method for executing a desired analysis with respect to a depth direction of a sample to be analyzed by irradiating a high-energy particle to said sample to be analyzed under a vacuum atmosphere, and detecting a number and a kinetic energy of electrons emitted from said sample to be analyzed on the basis of a photoelectric effect, **wherein the method comprises steps of ionizing a fullerene, irradiating the fullerene ionized at an accelerating voltage of from 2kV to 10kV to the surface of said sample to be analyzed before irradiating the high-energy particle to said**

sample to be analyzed, and etching the surface of said sample to be analyzed.

Independent claim 7 discloses, amongst other features, an electron spectroscopy analytical apparatus for executing a desired analysis with respect to a depth direction of a sample to be analyzed by irradiating a high-energy particle to said sample to be analyzed from a high-energy particle irradiating unit under a vacuum atmosphere, and detecting a number and a kinetic energy of electrons emitted from said sample to be analyzed by an analyzer on the basis of a photoelectric effect, **wherein the apparatus comprises an ion gun ionizing a fullerene and irradiating the fullerene ionized at the accelerating voltage of from 2 kV to 10kV, and the apparatus ionizes the fullerene and irradiates the fullerene ionized from said ion gun to the surface of said sample to be analyzed before irradiating the high-energy particle to said sample to be analyzed, and etches the surface of said sample to be analyzed.** The Applicant respectfully submits that Okada does not teach at least the electron spectroscopy analysis method or analytical apparatus as claimed.

The Examiner cites, among other things, layer 32 in Figure 7 of Okada as teaching an “etched C60 layer on the substrate.” A closer read reveals that Figure 7, in fact, shows reveals that layer 3 of Figure 7 is a *deposited* layer of C60 not an etched layer. In fact, as Okada explains in column 8 lines 38-55, the apparatuses and methods of Okada pertain to molecular beam epitaxy (MBE) which is a method of film deposition. Okada, as cited, fails to disclose at least etching a surface, as claimed.

The Examiner cites Okada and states. “wherein the method comprises steps of ionizing a fullerene (fig. 8, 52), irradiating the fullerene ionized to the surface of said sample to be analyzed (note: dotted line coming out of source 52 towards sample 1).”

However, the cited portion of Okada does not refer to a “sample” but, rather, a “substrate.” There is no indication in the cited portion of Okada that the “substrate” is a “sample to be analyzed,” as claimed in independent claims 2 and 7.

Therefore, Okada, as cited, fails to teach at least the combination of features claimed in claims 2 and 7 including ionizing a fullerene and etching a sample to be analyzed. Moreover, Okada, as cited, also fails to teach at least the combination of features claimed in claim 2 and 7 including irradiating the fullerene ionized at an accelerating voltage of from 2 KV to 10KV.

For at least the above reasons, Applicants respectfully submit that Okada does not anticipate independent claims 2 and 7 and claims 3-5 and 8-11, which depend, respectively, therefrom. Therefore, claims 2-5 and 7-11 are allowable. Accordingly, Applicants respectfully request reconsideration and withdrawal of the 35 U.S.C. §102(b) rejections.

Rejection Under 35 U.S.C. §103

Claims 2-5 and 7-11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Coxon et al. (U.S. Patent No. 5,665,967, hereinafter “Coxon”) in view of Hill et al. (GB No. 2386747 A, hereinafter “Hill”). The Applicant respectfully traverses this rejection because Coxon and Hill, either independently or in combination, fail to disclose each and every feature at least of independent claims 2 and 7 nor are the features of independent claims 2 and 7 obvious in view of the references.

Independent claim 2 discloses, amongst other features, an electron spectroscopy analysis method for executing a desired analysis with respect to a depth direction of a

sample to be analyzed by irradiating a high-energy particle to said sample to be analyzed under a vacuum atmosphere, and detecting a number and a kinetic energy of electrons emitted from said sample to be analyzed on the basis of a photoelectric effect, wherein the method comprises steps of ionizing a fullerene, irradiating the fullerene ionized at an accelerating voltage of from 2kV to 10kV to the surface of said sample to be analyzed before irradiating the high-energy particle to said sample to be analyzed, and etching the surface of said sample to be analyzed.

Independent claim 7 discloses, amongst other features, an electron spectroscopy analytical apparatus for executing a desired analysis with respect to a depth direction of a sample to be analyzed by irradiating a high-energy particle to said sample to be analyzed from a high-energy particle irradiating unit under a vacuum atmosphere, and detecting a number and a kinetic energy of electrons emitted from said sample to be analyzed by an analyzer on the basis of a photoelectric effect, wherein the apparatus comprises an ion gun ionizing a fullerene and irradiating the fullerene ionized at the accelerating voltage of from 2 kV to 10kV, and the apparatus ionizes the fullerene and irradiates the fullerene ionized from said ion gun to the surface of said sample to be analyzed before irradiating the high-energy particle to said sample to be analyzed, and etches the surface of said sample to be analyzed. The Applicant respectfully submits that the alleged combination of Coxon and Hill does not teach or render obvious at least the electron spectroscopy analysis method or analytical apparatus as claimed.

Coxon fails to teach or disclose at least irradiating the fullerene ionized to the surface of said sample to be analyzed before irradiating the high-energy particle to said sample to be analyzed, and etching the surface of said sample to be analyzed.

Although the Examiner alleges that using the ion gun of Coxon to etch a sample surface before performing electron spectroscopy is an “implicit function of the ion gun 8,” this is simply not the case. The function of the ion gun 8 is clearly articulated in column 8 lines 2-7 of Coxon:

The ion gun 8 is gated to enable it to produce bunches of ions [...] which are focused on a small area on the surface of the specimen 2, thereby releasing from that surface bunches of secondary ions **suitable for time-of-flight analysis**.

(emphasis added). Coxon, as cited, does not teach or suggest using the ion gun 8 to etch the surface, much less etching the surface before irradiating the high-energy particle to said sample, as claimed. In fact, Coxon, as cited, fails to teach or disclose etching the surface prior to electron spectroscopy analysis and the word “etch” is not even mentioned in the specification of Coxon. Hill, as cited, fails to account for this deficiency of Coxon.

As argued previously, the method of the instant invention uses C60, in part, to etch the surface in a way that creates low surface damage. This purpose is antithetical to the TOF-SIMS techniques discussed in both Coxon and Hill which, essentially, create a large amount of damage to the surface so that the debris can be mass analyzed. Indeed there would be little point to the claimed sputtering and analysis if it yielded the relatively high level of surface damage in most TOF-SIMS experiments.

Currently, specific properties of sputtering on C60 is discussed in academic journals and at academic conferences (see, e.g., Winograd, Analytical Chemistry, 2005, 143A (2005)). However, the sputtering methods require knowledge of X-ray Photoelectron Spectroscopy (XPS) and as well as knowledge of sputtering guns. Ion energy irradiated by a gas cluster ion beam, for example, varies if the amount of atoms varies. Particularly large irradiation devices, for example, are needed to provide a sufficient amount of atoms since retaining a gas cluster of less than 100 atoms is difficult. Further, it is also difficult for a gas cluster to reduce a pressure in an analytic device to 10^{-4} Pa or below. In comparison, fullerenes, such as C60, can relatively easily reduce the pressure in the analytic device to these pressures. In addition, with fullerenes such as C60, control of both the etching and the energy level is relatively easily accomplished since the mass of the fullerenes remains constant. Therefore, it is especially advantageous to use fullerenes on samples with easily damaged surfaces.

Both Hill and Coxon, as cited, are inventions related to emitting ions from a sample by a fullerene in order to measure the ions. Compared with those inventions, the present invention relates to using the fullerene for etching and measuring the ions on the basis of a photoelectric effect. Moreover, the combination of Hill and Coxon, as cited, also fails to teach at least the combination of features claimed in claim 2 and 7 including irradiating the fullerene ionized at an accelerating voltage of from 2 KV to 10KV. This accelerating voltage is not described in either of the cited references.

Coxon does disclose a method called Static-SIMS. Since, in this method, information can be obtained only from an extremely shallow region (within a few nm of the surface) of a sample, the method is used mainly for an analysis of surface physical

properties. Therefore, even if a sample is measured in an electron spectroscopic mode after TOF-SIMS, analysis is still made only on the outermost surface layer. It is not possible to analyze in the depth direction like the present invention.

During Static-SIMS, molecules tend to be broken into fragments due to a high energy in the vicinity of collision of primary ions. Secondary ions of molecules, provided as an object of measurement and analysis, are generated in a region apart from the collision point. Irradiating the kind of high energy primary ion beam in Static-SIMS has the purpose of securing secondary ions of molecules at a fixed rate. Therefore, in the case of the energy of primary ions used in Static-SIMS, there is a possibility that fragments of broken molecules are left on a surface of a sample. In order to suppress surface damage of a sample, it is preferable to minimize collision energy, suppress destruction of molecules at a collision point and to irradiate ion beam with the energy of releasing unbroken molecules as much as possible. However, it is necessary to increase energy for etching small atoms and molecules such as Ar atoms (typically used in this context) which results in breaking molecules due to a collision with high energy.

Compared with the above and the techniques and methods generally described in Coxon and Hill, as cited, this application relates to a collision of large molecules, such as a fullerene, with low energy (i.e., accelerating voltage of ion beam from 2kv to 10kv) for allowing etching with decreased damage of a sample surface.

For at least the above reasons, Applicants respectfully submit that independent claims 2 and 7 and claims 3-5 and 8-11, which depend, respectively, therefrom are not

obvious over the proposed combination of Coxon and Hill. Thus, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. §103(a).

CONCLUSION

Applicants respectfully submit that this application is in condition for allowance and such action is earnestly solicited. If the Examiner believes that anything further is desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below to schedule a personal or telephone interview to discuss any remaining issues.

In the event that this paper is not being timely filed, Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to Counsel's Deposit Account Number 01-2300, referencing Docket Number 029567-00008.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Jack Smith", is written over the printed name.

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